in which the strongest immigration occurred under such conditions the period of the chief movement was protracted to about nineteen (instead of about nine) days.

Dr. Defant has clearly proved that a certain type of weather is peculiarly favourable for the spring immigration of Austrian birds. He is to be congratulated on his clear and well reasoned treatment of very unwieldy data and on having made a valuable contribution to a difficult subject.

His further speculations are, however, open to serious criticism. He believes that the important factor in this type of weather is the wind and that birds prefer to fly with it behind them. His reasons as to *why* birds should do so seem to us to be wholly beside the point, and as the much more comprehensive results already obtained in this country are entirely opposed to Dr. Defant's theory, we cannot accept it, however temptingly obvious it may seem, on such very slender grounds.

The alternative theory is that "the winds and the performance, or non-performance, of the migratory movements are the effects of a common cause—namely, the particular type of weather prevailing at the time, which may be favourable or unfavourable for the flight of birds. . . ." (Eagle Clarke, "Studies in Bird Migration," 1912, p. 173).

In the British area there are certain types of weather favourable respectively for migration between the British Isles and northern Europe, between the British Isles and Iceland, and between the British Isles and south-western Europe. The winds accompanying these types of weather *may or may not* be in the same direction as the movements concerned. Furthermore, the same types of weather favour these movements both in autumn and in spring, the direction of flight being reversed, while the prevailing winds remain the same.

In Dr. Defant's simpler case it so happens that the favourable type of weather he has discovered produces a wind in the same direction as that of immigration from the Balkan Peninsula (his region "A") to Austria; but the immigration from the south-west ("B") probably forms a large part of the movements which were the subject of investigation. It is unfortunate that only the spring migrations have been dealt with. Should the same type of weather with its accompanying winds prove to be favourable to the autumn emigration (as in the case of the British movements), Dr. Defant's theory would be quite untenable.

In the meantime, Dr. Defant's selection of wind as the important factor is purely speculative, and his view entails an entirely different relation between birds and weather in Austria from that existing in the British Isles. While rejecting his theory of the importance of wind as unproven and improbable, we feel grateful for the new facts which he has added to our knowledge of bird migration by his most laborious and thorough research.

A. LANDSBOROUGH THOMSON.

METROLOGICAL RESEARCHES.[1]

THE volumes referred to below contain particulars of recent metrological researches made at the international bureau of weights and measures. As the result of a long series of investigations on the length of invar wires used for geodetical measurements, it has been found that wires made of metal taken from the same tapping or ladle and treated in the same manner have practically the same coefficients of expansion; the differences from the mean lying within $\pm 0{\cdot}03 \times 10^{-6}$. If the same coefficient of expansion were adopted for all such wires it would need a difference of temperature of 30° C. to introduce an error of one part in a million. There is now no difficulty in procuring invar wires having a coefficient of expansion as small as $0{\cdot}1 \times 10^{-6}$.

At the fifth general conference on weights and measures held in Paris in October last, a resolution was passed to the effect that in view of the fact that the force of gravity is not precisely the same at sea-level for all places having the same latitude, it was undesirable that the value adopted for the normal force of gravity (viz., 980·665 cm. sec.$^{-2}$) should continue to be defined as that corresponding to a particular latitude (45°). In the reduction of observations the theoretical factor given by Clairaut's formula in the amended form now usually adopted should no longer be employed, but merely the numerical ratio of the normal force of gravity to that at the place of observation, the latter being determined directly if possible.

The normal scale of temperature hitherto adopted at the international bureau of weights and measures has been that of hydrogen at constant volume. The fifth general conference resolved that the absolute thermodynamic scale shall be substituted for the hydrogen scale as soon as the table of reduction from one scale to the other has been determined with sufficient certainty. It was also recommended that a number of thermometric fixed points be ascertained with as great accuracy as possible, in order to facilitate the calibration of thermometers. A meeting of the principals of the various national laboratories is to be arranged at Sèvres for the purpose of deciding what these fixed points shall be and how they are to be determined, as well as to promote their general recognition.

The question of the determination of the length of the metre in terms of wave-lengths of light was considered at the fourth general conference. It was decided that investigation on this subject had not then reached the stage for the conference to adopt any particular number of wave-lengths as representing the metre. Further researches made by physicists will be carefully studied at the international bureau with the view of obtaining in the course of time a fundamental

[1] Comité internationale des poids et mesures. Procès-verbaux des séances. Deuxième série, tome vii., session de 1913. Pp. v+140. (Paris: Gauthier-Villars, 1913.)

Travaux et Mémoires du bureau international des poids et mesures. Tome xv. (Paris: Gauthier-Villars, 1913.)

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relation between the metre and a suitable wave-length of light.

All who have been brought into contact with Dr. René Benoît, for so many years director of the international bureau, will regret to hear that he will be retiring from that position at the end of the present year. Dr. Benoît has been identified with all the principal researches which have been undertaken at that institution during the last thirty-six years. In this country his services in connection with establishing the relations between the units of the British and the metric systems of weight and measure will be especially remembered.

A GREAT TELESCOPE FOR CANADA.

A NOTABLE addition is to be made to the equipment of the Dominion Astronomical Observatory at Ottawa, Canada. At present its chief instrument is a 15-in. refractor. This has been used mainly for radial velocity determinations, and for some time its limitations have been keenly felt. Using low dispersion, spectrograms of fifth magnitude stars could be obtained, but beyond this it was ineffective, and it was recognised that further progress demanded a more powerful instrument. Supported by various scientific societies and representative astronomers, the chief astronomer, Dr. W. F. King, appealed to the Dominion Government for improved equipment, and the request was successful.

Contracts have been made for the construction of a 72-in. reflector. The optical parts will be made by the John A. Brashear Co., of Pittsburgh, Pa., and the mounting by Warner and Swasey, of Cleveland, Ohio. The cost will be about 90,000 dollars (18,000*l.*).

The focal length of the great mirror will be 30 ft., with a hole ten inches in diameter at its centre to allow for a Cassegrain combination. For this purpose a convex hyperboloidal mirror, with an aperture of 19 in. and a focal length of 10 ft., will be placed 23 ft. above the main mirror. The resulting focal length will be 108 ft.

The mounting will resemble those of the Melbourne and Ann Arbor reflectors. The skeleton tube will be at one side of the long polar axis, nearly midway between its bearings, the balance being restored by the declination mechanism and counterweights on the other side of the axis. It is hoped to have the telescope completed within two years.

The instrument will be used primarily for spectrographic determination of radial velocities. For the brighter stars it will be used in the Cassegrain form just described, the spectrograph being attached in the axis of the tube, below the 10-in. opening in the mirror. For the fainter stars a low-dispersion spectrograph will be attached at the principal focus. Direct photography of nebulæ, clusters, and other small areas of the sky will also be attempted.

To be used effectively, such an instrument demands a suitable position, and for more than a year Mr. W. E. Harper, of the observatory staff, has been investigating the astronomical possibilities of various regions ranging from Ottawa to the Pacific coast. Of all those tested, Victoria, B.C., showed a decided superiority in good "seeing" and small nocturnal range of temperature, and accordingly that place was chosen. The precise site is on Saanich Hill (elevation 732 ft.), about seven miles north of the city, from which it is easily reached by electric railway and carriage road.

The great dome will be 66 ft. in diameter and 60 ft. high. A building to contain offices, library, and reading rooms will also be erected. The total cost of buildings and equipment will be about 200,000 dollars (40,000*l.*). All the plans and specifications have been made by Dr. J. S. Plaskett, after consultation with many experts, and he will be in charge of the station.

C. A. CHANT.

NOTES.

DR. F. W. DYSON, Astronomer Royal, has been elected a correspondant of the Paris Academy of Sciences, in the section of astronomy.

VICE-ADMIRAL SIR EDMOND J. W. SLADE, K.C.I.E., K.C.V.O., has consented to act as president of the Meteorological Conference to be held in Edinburgh next September.

THE Bill introduced in the House of Commons by Sir Frederick Banbury, to prohibit experiments on dogs, was withdrawn on Tuesday, June 30, after a number of amendments to the principal clause had been carried in the Standing Committee appointed to consider the Bill.

MR. W. O. REDMAN KING, lecturer in zoology at the University of Leeds, has been appointed Ray Lankester investigator at the Marine Biological Laboratory at Plymouth, in succession to Prof. E. L. Bouvier, of Paris. The investigator is required to undertake research work of his own choosing at the laboratory for a period of five months, the emolument being 70*l.*

SIR JAMES CAIRD, of Dundee, has given 24,000*l.*, free of any conditions, to Sir Ernest Shackleton's Imperial Trans-Antarctic expedition. This gift relieves Sir Ernest of anxiety as to the financial side of the expedition, which will now be able to start well equipped in about a month's time. Further subscriptions would, however, be not unwelcome, and would be used to obtain accessories for increased efficiency.

THE Geologists' Association has arranged a long excursion to the Rhenish Westphalian Upland, including the volcanic districts of the Eifel, Siebengebirge, etc., on September 4–19 next. The various daily excursions will be attended by Prof. G. Steinmann, Dr. Tilman, and others as directors. The official party will leave Charing Cross on September 4, at 9 p.m. The excursion secretary is Mr. E. Montag, 18 Woodchurch Road, Prenton, Birkenhead.

AT the annual meeting of the Royal Society of Arts, held on Wednesday, June 24, the Duke of Connaught

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